STANDARD FORM NO. 64

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OC-5585

Office Memorandum • UNITED STATES GOVERNMENT

TO : Chief, Technical Services Staff **DATE:** 29 SEP 1955

FROM : Director of Communications

SUBJECT: Infrared Communication Systems Development

1. It is my understanding that TSS is preparing to negotiate a contract with [redacted] for the development of a short range infrared communications device using funds supplied by TSS. Since both the Office of Communications and TSS are involved in contract work on infrared equipment, I have had my staff investigate the possibility of parallel effort in the development of infrared communications systems for Agency use. The study, of which a copy is attached, has revealed that while operational characteristics are somewhat similar, the technical developments being pursued are not duplications of effort and will produce equipment superior to that already in existence. 25X1

2. I also understand that your original proposal [redacted] for the short-range communications equipment is expected to be modified slightly with respect to the number of prototypes delivered [redacted] and the inclusion of engineering drawings and specifications. This modification is acceptable to the Office of Communications. 25X1 25X1

[redacted] 25X1

Orig & 1: Addressee
W/Att.

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[redacted] 25X1

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To : Director of Communications

From : Chairman, Research and Development Production Review Board

Subject : Infrared Communication Systems

Reference: Minutes of Research and Development Production Review Board Meeting No. 47 Convened 1400, 3 August 1955.

1. A proposal received from [redacted] for the development of short range infrared communications equipment was included in the agenda of the referenced Board meeting. In the absence of a Staff Study on current infrared communications development activities, a clarification is forwarded for the record to show that a duplication of effort does not exist with the acceptance of the [redacted] proposal. 25X1 25X1

2. Current infrared communication development activity includes [redacted] 25X1 25X1 25X1 The above interests constitute all known development work on infrared communication systems except for a non-compatible, pulse modulated, infrared system under development at [redacted] Pertinent data on Agency interested equipment follows: 25X1 25X1

A. [redacted] Long Range Infrared Transceiver 25X1

Range	6-8 miles
Source	Tungsten (30 watts)
Detector	Ektron lead sulfide
Modulation	Galvanometer actuated mirror
Weight	30 lbs.
Dimensions	18" X 15" X 7"
Delivery	2 received, 15 due 31 August with 4 to follow
Cost	$200,000 (approximately)

Comment:

The modulating component incorporated in the design of this equipment is responsible for making the unit superior to any known infrared communications device. The galvanometer actuated mirror has particular Agency application since it is small, rugged, and consumes little power (50 - 100 milliwatts). The narrow beamwidth of the equipment (1 1/4 X 1/4 degrees transmit and 1/3 X 1/3 degrees for receive) revealed a 13 mile daylight operating range with adequate voice reception with the indication that CW operation is possible over even greater a range. Nighttime communicating ranges exceed those of daylight due to an improvement in the signal-to-noise ratio. Physical alignment of the equipment for initial contact requires a signal plan due to the narrow beamwidth and the fact that the equipment functions as a transceiver. A 1 kilocycle tone is provided to assist in alignment as well as infrared viewer with a nominal 9 mile nighttime range. Prototypes to follow will have provisions for keying the tone for CW operation. Equipment is powered by four 10 ampere hour Yardney Silvercels. The battery power supply as well as a battery charger are contained within the equipment housing.

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B. [redacted] Medium Range Infrared Transceiver 25X1

Range	2 1/2 - 3 miles
Source	Cesium Vapor Lamp
Detector	Optionally Thallous Sulfide or Lead Sulfide
Modulation	Electrical
Weight	7 1/2 pounds plus NiCd rechargeable battery
Dimensions	13" X 8" X 4.5" (Battery 13" X 5" X 4 1/2")
Delivery	2 units 15 November, 4 units March 1956 plus 24 spare lamps
Cost	$60,000

Comment:

A tungsten source has low efficiency due to power lost in white light and cannot be electrically modulated (except as noted for the short range equipments). The cesium vapor lamp is [redacted] approach to overcoming the shortcomings of the tungsten filament. 25X1 The cesium vapor lamp is rich in infrared radiation with practically no visible light and in addition can be electrically modulated. The lamp is being developed by [redacted] at a cost of $30,000 and is included in the development cost. 25X1 The wide beamwidth of this equipment will permit operation from a moving vehicle and otherwise permit ease of alignment for initial and continued contact. While [redacted] prefers the thallous sulfide detector capable of nighttime reception only, they will investigate the characteristics of the recently improved "Ektron" lead sulfide detector which will permit daylight as well as nighttime operation. 25X1 The modulator consumes 7 watts. A ten-minute warmup period is necessary for ionization to take place within the cesium vapor lamp prior to transmitting.

C. [redacted] Short Range Infrared Transmitter and Receiver 25X1

Range	1/2 to 3/4 mile
Source	Tungsten
Detector	Thallous Sulfide
Modulation	Electrical
Weight	2 1/2 pounds (receiver plus transmitter)
Dimensions	Flashlight 11" long, Head 3"D, Case 2"D (two units)
Delivery	2 prototypes 1 September; Balance of 4, 1 January 1956
Cost	$15,000

Comment:

This is an interim equipment and based on a finding that a low power (250 milliampere) tungsten source can be electrically modulated. The equipment will have an approximate 8 degree beamwidth and be camouflaged to resemble an ordinary flashlight. The detector will be thallous sulfide for nighttime reception only. Receiver batteries will be self contained. Transmitter batteries (2 67.5 volt batteries) will be pocket-size.

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D. [redacted] Short Range Infrared Telephone 25X1

Range	500 yards
Source	Tungsten
Detector	Ektron lead sulfide
Modulation	Electrical
Weight	10 pounds
Dimensions	8" X 10" X 4"
Delivery	1 August 1956
Cost	$125,000 (G-2)

Comment:

This is [redacted] version of the electrically modulated 250 milliampere tungsten source. A contract was awarded in late July 1955 for the development and production of 90 units of equipment as a G-2 requirement at the above cost. We have requisitioned 10 units (4 for TSS) at prorated cost of approximately $13,000. The equipment is a transceiver of briefcase dimensions with self-contained dry batteries. The lead sulfide detector will permit 24 hour operation. 25X1

E. [redacted] Short Range Infrared Communications Equipment (Proposal) 25X1

Range	3/4 & 3 miles
Source	Tungsten
Detector	Ektron lead sulfide
Modulation	Galvanometer Actuated Mirror
Weight	Minimum
Dimensions	1 1/2" X 4 1/2" X 6"
Delivery	12 months from award of contract
Cost	$180,000

Comment:

[redacted] proposal for the development of Short Range equipment is a continuation of the infrared communications development activity that resulted in the successful design of the Long Range equipment; thus, the equipment will incorporate many of the qualifying design features resulting from that work and include the tungsten filament source, the Ektron lead sulfide detector, the galvanometer actuated mirror for 0 to 100% modulation, the square aperture (for minimum modulation distortion) and an oscillator tone for physical alignment for initial contact. 25X1

The study phase of the proposal reflects a consideration of TSS/OC concept of the equipment and includes among other necessary investigations, such features as duplex operation (not a transceiver) to simplify alignment, a wide angle beamwidth for alignment and narrow beam operate, a push to talk switch mounted on the microphone to conserve battery life and total or partial transistorization of the amplifier.

The beamwidth as proposed is 1.15 degrees X 2.3 degrees transmit and 2 1/4 degrees X 2 1/4 degrees.

3. In consideration of the above, it may be seen that equipments having somewhat similar operational characteristics are being developed by several contractors; however, the technique of parallel development along different technical lines has accelerated design investigations, and has already produced equipment superior to that previously in existance. A continuation of such efforts with the acceptance of the [redacted] proposal should result in a further advance in the technological development of infrared communications equipment; such action is hereby recommended. 25X1

[redacted] 25X1